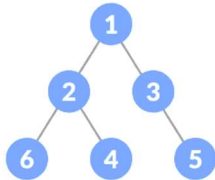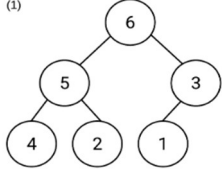# Shiv Nadar University Chennai

End Semester Examinations, 2023-2024 Odd

Question Paper

Name of the Program: B.Tech. CSE (IoT)	Semester: III
Course Code & Name: CS1006T DATA STRUCTURES	
Regulation 2021	
Time: 3 Hours		Maximum: 100 Marks

Q.No		Questions	Marks	CO#	KL#
		Part A – Answer all the questions (10×2= 20 Marks)			
1		Consider the following sequence of operations on an empty stack. push(54); push(52); pop(); push(55); push(62); s = pop(); Consider the following sequence of operations on an empty queue. enqueue(21); enqueue(24); dequeue(); enqueue(28); enqueue(32); q = dequeue(); The value of s + q is _____	2	CO2	KL3
2		Compute the post fix equivalent of the following expression. 3 * (x+1) - a/2	2	CO2	KL3
3		Suppose a circular queue of capacity (n – 1) elements is implemented with an array of n elements. Assume that the insertion and deletion operations are carried out using REAR and FRONT as array index variables, respectively. Initially, REAR = FRONT = 0. Write the conditions to detect queue full and queue empty.	2	CO2	KL3
4		Why array is only suitable for binary search? Substantiate with an example.	2	CO1	KL2
5		Deduce what type of tree is given below? Record your observations on the type of tree.	2	CO3	KL3
6		A binary search tree is generated by inserting in order of the following integers: 50, 15, 62, 5, 20, 58, 91, 3, 8. Write the number of nodes in the left subtree and right subtree of the root.	2	CO3	KL3
7		Write down the best- and worst-case time complexity of insertion sorting algorithm.	2	CO4	KL2
8		Compute the time complexity of the following code snippet. for (int i = 1; i <= n; i *= c) { // some O(1) expressions }	2	CO1	KL3

| | | ```
for (int i = n; i > 0; i /= c)
 {
   // some O(1) expressions
 }
``` | | | |
|---|---|---|---|---|---|
9		Determine the tree type for the given data structure. Insert 7 into the set of elements and showcase the outcome of insertion, 	2	CO5	KL3
10		The keys 12, 13, 2, 23 and 5are inserted into an initially empty hash table of length 10 with hash function $h(k) = k \bmod 10$ using linear probing. What is the resultant hash table?	2	CO5	KL3
Part B – Answer all the questions (8×10= 80 Marks)					
| 11 | a | Consider the following function:<br>```
void fun (int a, int b)
{
   while (a != b) {
     if (a > b)
       a = a - b;
     else
       b = b - a;
   }
}
```<br>Analyze the best- and worst-case time complexity if the above function is called. | 5 | CO1 | KL3 |
	b	Write the routine to insert an element in the middle of an application that helps you navigate in both directions. Show the representations and perform traversal.	5	CO2	KL2
12	a	Convert the infix expression a/b - c+ d * e – a * c into postfix expression. Write a function to evaluate that postfix expression and trace that for given data a=6, b=3, c = 1, d = 2, e =4.	10	CO2	KL3
13	a	Create a Binary Search Tree for the following data and do in-order, Preorder and Post-order traversal of the tree. 50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5. Showcase stepwise construction status and traversal logics.	10	CO3	KL3
14	a	Find the number of different topological orderings possible for the graph given below:	10	CO3	KL3

15	a	Solve the minimum spanning tree problem for the following graph: a. What list of edges will you include from the graph to construct MST? b. What is the total weight of resulting MST?	10	CO3	KL3
16	a	Write an algorithm to sort 'n' numbers using merge sort. Show how the following numbers are sorted using merge sort: 42, 28, 90,2, 89, 56, 39, 12, 87, 54.	10	CO4	KL3
17	a	Construct an AVL Tree for the given set of data 14, 4, 21, 3, 9, 15, 28, 2, 7, 10, 18, 26, 30. Delete 28 and 18. Preserve AVL property post deletions too.	10	CO3	KL3
18	a	Find the single source shortest path for the given graph by assuming A as the starting vertex. Showcase the table status for every vertex to be visited.	10	CO3	KL3
19	a	Let us consider the list of numbers {34, 16, 2, 93, 80, 77, 51} and the hash table size is 10. a. What is the order of elements (from index 0 to 9) in the hash table? b. Show the result of inserting a new element 60 using linear probing.	10	CO5	KL3

KL – Bloom's Taxonomy Levels

(KL1: Remembering, KL2: Understanding, KL3: Applying, KL4: Analyzing, KL5: Evaluating, KL6: Creating)

CO – Course Outcomes

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